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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/534,072

02/17/2006

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P2002J114

2772

27810

7590

08/18/2008

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EXAMINER

FORREST, MICHAEL

ART UNIT

PAPER NUMBER

4162

MAIL DATE

DELIVERY MODE

08/18/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/534,072	Applicant(s) MALEK ET AL.	
	Examiner MICHAEL FORREST	Art Unit 4162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Objections

1. Claim 19 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 18 discloses partial decomposition by calcination or pyrolysis. Claim 19, dependent on Claim 18, discloses calcination or pyrolysis at a temperature below that which results in total weight loss. If calcination or pyrolysis results in partial decomposition it is at a temperature which is below that which results in total weight loss of the organic complex.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 1 twice recites the limitation "the organic metal complex". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-3, 17-18, 26, 31-32, and 34-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Mauldin(US Patent 5,863,856). Mauldin teaches a method of producing a catalyst by co-deposition of a catalytically active metal with a multi-functional carboxylic acid on to a support (see col 2, lines 6-29). Mauldin further teaches that the carboxylic acid can be a nitrogen-containing compound including amino acid (see col 2, lines 30-47). Mauldin further teaches that the multi-functional carboxylic acid is decomposed by calcination (see col 3, lines 1-4). Mauldin further teaches further treatment of the calcined catalyst with a reducing agent (see col 3, lines 4-7). Mauldin does not specifically teach that the decomposition of the organo-metallic is only partial. Mauldin also does not specifically teach that the decomposed organo-metallic complex retains between 10 and 95% by weight of the dry weight attributed to the organic complex prior to decomposition. Mauldin also does not specifically teach that the decomposed organo-metallic complex exhibits one or more infra-red absorption bands between 2100-2200 cm^{-1} .

7. Regarding the partial decomposition, Mauldin teaches a method of producing a catalyst where an organo-metallic complex deposited onto a support is calcined at a temperature from 200 to 550°C (see col 4, lines 55-60). Example 10 of the instant application discloses that calcination at 275°C results in partial decomposition of the organic complex. Mauldin's method with calcination performed at 275°C will inherently result in the same partial decomposition as claimed in the instant application.

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8. Regarding retention of between 10 and 95% by weight of the dry weight attributed to the organic complex prior to decomposition, calcination performed at partial decomposition temperatures of the same nitrogen-containing organic compounds as taught by Mauldin will inherently result the same amount of decomposition.
9. Regarding exhibiting one or more infra-red absorption bands between 2100-2200 cm^{-1} , the instant application teaches that the IR spectroscopy bands are features of complexed carbon nitrogen species produced by partial decomposition of nitrogen-containing organic compounds. Calcination of the same nitrogen-containing organic compounds at partial decomposition temperatures taught by Mauldin will inherently exhibit the same bands.
10. Regarding Claim 2&3, Mauldin further teaches a method where the calcined catalyst is activated by reduction with Hydrogen (see col 3, lines 4-7).
11. Regarding Claim 17, Mauldin teaches the method wherein the nitrogen-containing organic compound is glycine, alanine, leucine, serine, or threonine (see col 7, Table 1).
12. Regarding Claim 18, Mauldin teaches that the method comprises decomposition by calcination (see col 3, lines 1-4).
13. Regarding Claim 26, Mauldin teaches a method where the catalyst support is silica (see col 3, lines 66-67).
14. Regarding Claim 31, Mauldin teaches a method where the catalyst support is alumina (see col 3, lines 66-67).
15. Regarding Claim 32, Mauldin teaches a method where the catalyst support is a material selected from the group consisting of rutile titanium dioxide, anatase titanium dioxide, and mixtures thereof (see col 5, lines 49-50).

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16. Regarding Claims 34-35, Mauldin teaches a method where the catalytic metal is copper or an Iron Group metal (see col 2, lines 6-29).

17. Regarding Claim 36, Mauldin teaches a method where the salt of the catalytically active metal is a nitrate salt (see col 4, lines 5-7).

18. Regarding Claim 37, Mauldin teaches that the catalysts are useful in the conversion of synthesis gas to C₅₊ hydrocarbons (see col 4, line 66 to col 5, line 3).

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. **In the alternative to anticipation as recited above**, Claims 1-3, 16-19, 20, 22-26, 31-32, and 34-37 are rejected under 35 U.S.C. 103(a) as being unpatentable by Mauldin(US Patent 5,863,856). Mauldin teaches a method of producing a catalyst by co-deposition of a catalytically active metal with a multi-functional carboxylic acid on to a support (see col 2, lines 6-29). Mauldin further teaches that the carboxylic acid can be a nitrogen-containing compound including amino acid (see col 2, lines 30-47). Mauldin further teaches that the multi-functional carboxylic acid is decomposed by calcination (see col 3, lines 1-4). Mauldin further teaches further treatment of the calcined catalyst with a reducing agent. Mauldin does not teach that the decomposition of the organo-metallic is only partial. Mauldin also does not teach that the decomposed organo-metallic complex retains between 10 and 95% by weight of the dry weight attributed to the organic

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complex prior to decomposition. Mauldin also does not teach that the decomposed organo-metallic complex exhibits one or more infra-red absorption bands between 2100-2200 cm^{-1} .

21. Regarding partial decomposition, Mauldin teaches a method of producing a catalyst where an organo-metallic complex deposited onto a support is calcined at a temperature from 200 to 550°C (see col 4, lines 55-60). Example 10 of the instant application discloses that calcination at 275°C results in partial decomposition of the organic complex resulting in improved control on the dispersion of the catalytic metal. It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the calcination temperature within the 200-550°C range taught by Mauldin to improve dispersion.

22. Regarding retention of between 10 and 95% by weight of the dry weight attributed to the organic complex prior to decomposition, calcination performed at partial decomposition temperatures of the nitrogen-containing organic compounds as taught by Mauldin will inherently result the same amount of decomposition.

23. Regarding exhibiting one or more infra-red absorption bands between 2100-2200 cm^{-1} , the instant application teaches that the IR spectroscopy bands are features of complexed carbon nitrogen species produced by partial decomposition of nitrogen-containing organic compounds. Calcination of the nitrogen-containing organic compounds at partial decomposition temperatures taught by Mauldin will inherently exhibit the same bands.

24. Regarding Claim 2&3, Mauldin further teaches a method where the calcined catalyst is activated by reduction with Hydrogen (see col 3, lines 4-7).

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25. Regarding Claim 16, Mauldin teaches the method where the nitrogen-containing organic compounds are the amino acids: glycine, alanine, leucine, serine, or threonine (see col 7, Table 1). Mauldin further teaches that 4C to 6C organic compounds produced higher dispersion than the 3C compounds listed (see col 6, lines 54-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a 6C amino acid like arginine to produce higher dispersion.
26. Regarding Claim 17, Mauldin teaches the method wherein the nitrogen-containing organic compound is glycine, alanine, leucine, serine, or threonine (see col 7, Table 1).
27. Regarding Claim 18, Mauldin teaches that the method comprises decomposition by calcination (see col 3, lines 1-4).
28. Regarding Claim 19&20, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the calcination temperature within the 200-550°C range taught by Mauldin resulting in a temperature below total weight loss of the organic complex.
29. Regarding Claim 22-25, the instant claims only disclose intended results of the process claimed and are not further limiting.
30. Regarding Claim 26, Mauldin teaches a method where the catalyst support is silica (see col 3, lines 66-67).
31. Regarding Claim 31, Mauldin teaches a method where the catalyst support is alumina (see col 3, lines 66-67).
32. Regarding Claim 32, Mauldin teaches a method where the catalyst support is a material selected from the group consisting of rutile titanium dioxide, anatase titanium dioxide, and mixtures thereof (see col 5, lines 49-50).

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33. Regarding Claims 34-35, Mauldin teaches a method where the catalytic metal is copper or an Iron Group metal (see col 2, lines 6-29).

34. Regarding Claim 36, Mauldin teaches a method where the salt of the catalytically active metal is a nitrate salt (see col 4, lines 5-7).

35. Regarding Claim 37, Mauldin teaches that the catalysts are useful in the conversion of synthesis gas to C₅₊ hydrocarbons (see col 4, line 66 to col 5, line 3).

36. Claim 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mauldin(US Patent 5,863,856) as applied to claim 2 above, and further in view of Huang(US Patent 5,332,705). As applied to claim 2, Mauldin teaches a process of manufacturing a catalyst by co-deposition of a metal salt and a nitrogen-containing organic compound on a support material, forming an organo-metallic compound, partially decomposing the organo-metallic compound, and reducing the decomposed compound to catalytically active metal. Mauldin does not teach that the reductant is provided in-situ or in a regenerative process. Huang teaches a method of regenerating a catalyst by reducing with hydrogen in situ (see col 2, lines 45-55). Regeneration of a catalyst in situ is more efficient and reduces reactor downtimes. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a reducing agent during a catalyst regeneration process to improve efficiency of the reactor operation as taught by Huang.

37. Claim 7, 27-30, 33, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mauldin (US Patent 5,863,856) and further in view of Shih (US Patent

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5,344,553). As applied to claim 1, Mauldin teaches a process of manufacturing a catalyst by deposition of a metal salt and a nitrogen-containing organic compound on a support material, forming an organo-metallic compound, partially decomposing the organo-metallic compound, and converting the partially decomposed compound to catalytically active metal. Mauldin does not teach a process wherein the nitrogen-containing organic compound is incorporated into the support during its synthesis. Shih teaches a method of preparing a catalyst, the method comprising synthesis of a crystalline material that includes incorporation of an organic compound (see col 16-42). Shih further teaches that the crystalline material is a support for impregnation of catalyst metals by nitrate salts (col 11, lines 41-59). The organic compound acts as a directing agent to disperse metal by directing nucleation sites. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the nitrogen-containing organic compound into the synthesis, as taught by Shih, to disperse the catalyst metal and direct nucleation.

38. Regarding Claim 27, Shih teaches a process of manufacturing a catalyst where the catalyst comprises silica gel (see col 19, lines 49-59).

39. Regarding Claim 28-30, Shih teaches a process of manufacturing a catalyst comprised of MCM-41, which is a subclass of M41S and an ordered mesoporous material (see col 4, lines 54-68).

40. Regarding Claim 38, Shih teaches a process of manufacturing a catalyst that further comprises zirconia (see col 4, lines 54-68).

41. Regarding Claim 38, Shih teaches a method of removing sulfur from shale oil by contacting the shale oil with a NiMo MCM-41/ Al_2O_3 catalyst (see Example 1, col 21).

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42. Claims 8-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mauldin (US Patent 5,863,856) as applied to claim 1 above, and further in view of Engel (US Patent 2,650,906). As applied to claim 1, Mauldin teaches a process of manufacturing a catalyst by co-deposition of a metal salt and an organic compound on a support material, forming an organo-metallic compound, decomposing the organo-metallic compound, and reducing the decomposed compound to catalytically active metal. Mauldin does not teach a method wherein the nitrogen-containing organic compound is an aliphatic amine containing one or more hydroxyl groups. Engel teaches a method of making a catalyst having deposited metals using alkanolamine in the impregnating solution (see col 2, lines 37-42). Engel further teaches that the alkanolamines may be primary, secondary, or tertiary alkanolamines (see col 2, line 55 to col 3, line 4). Engel teaches that using alkanolamines in the impregnating solution avoids undesirable precipitates and increases the dispersion (see col 2, lines 43-49). It would have been obvious to one of ordinary skill in the art at the time of the invention to use alkanolamines in an impregnation solution as taught by Engel to avoid undesirable precipitation and increase the impregnation.

Conclusion

43. Claims 1-38 are pending. Claims 1-38 are rejected.

44. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL FORREST whose telephone number is (571)270-5833. The examiner can normally be reached on Monday - Thursday, 9:00am - 4:00pm.

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45. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571)272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

46. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer McNeil/
Supervisory Patent Examiner
Art Unit 4162

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MF